

Discuss the continuity of each function

(a) $f(x) = \frac{1}{x} \rightarrow$ continuous function, discontinuous at $x=0$ (infinite)
continuous on the intervals $(-\infty, 0)$ $(0, \infty)$

(b) $g(x) = \frac{x^2-1}{x-1} \rightarrow \frac{(x+1)\cancel{(x-1)}}{\cancel{(x-1)}} \rightarrow x+1$, hole at $x=1$
(discontinuity - removable)

\rightarrow continuous function

$\rightarrow (-\infty, 1) (1, \infty)$ continuous

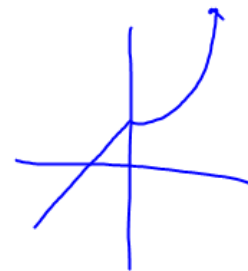
(c) $h(x) = \begin{cases} x+1, & x \leq 0 \\ x^2+1, & x > 0 \end{cases}$

\rightarrow continuous function

1. $\lim_{x \rightarrow 0^+} f(x) = 1$

2. $\lim_{x \rightarrow 0^-} f(x) = 1$

$\left. \begin{matrix} 1. \\ 2. \end{matrix} \right\} \lim_{x \rightarrow 0} \text{exist} = 1$

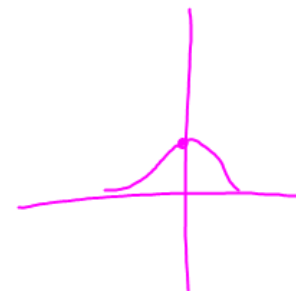


(d) $y = \frac{\sin x}{x}$

2. $f(0) = 1$

3. $f(0) = \lim_{x \rightarrow 0} f(x)$

\rightarrow continuous function
discontinuity at $x=0$ (removable)



$f(x) = \lceil x \rceil$ greatest integer function

$$\lceil 1.5 \rceil = 2$$

$$\lceil -2.1 \rceil = -2$$

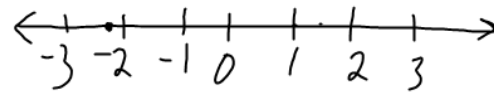
$$\lceil 1.9 \rceil = 2$$

$$\lceil -3.9 \rceil = -3$$

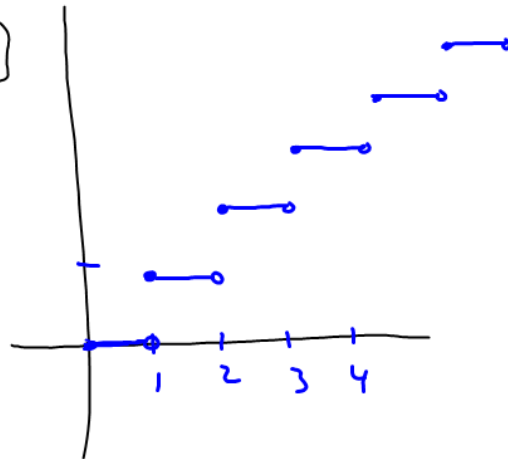
$$\lceil 2.75 \rceil = 3$$

$$\lceil 12 \rceil = 12$$

$$\lceil 1.9999999 \rceil = 2$$



$f(x) = \lceil x \rceil$



x	$f(x)$
0	0
0.5	0
0.9	0
1	1

$$1^{\text{st}} \text{ year} = 36,500$$

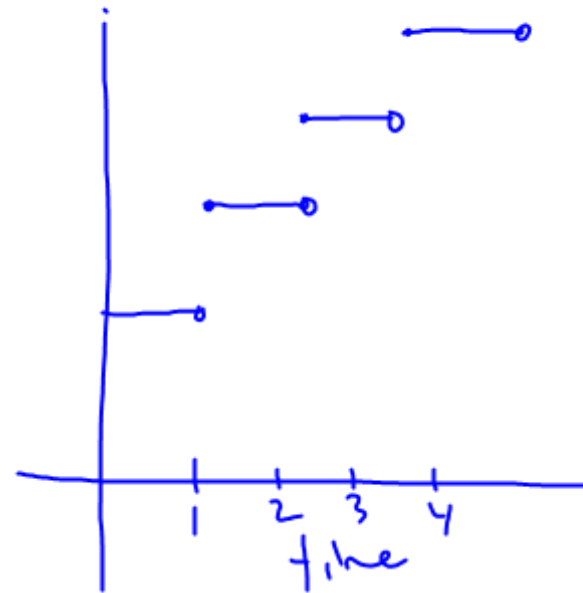
$$2^{\text{nd}} \text{ year} = 36,500(1.035)^1$$

$$3^{\text{rd}} \text{ year} = 36,500(1.035)^2$$

$$4^{\text{th}} \text{ year} = 36,500(1.035)^3$$

continuous all x ,
 $x \neq 1, 2, 3, 4, \dots$

$$[0, 1) \cup (1, 2) \cup (2, 3) \cup (3, 4)$$

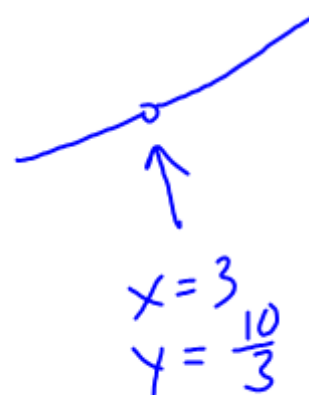


p. 81 - Exploration 1

$$f(x) = \frac{x^3 - 7x - 6}{x^2 - 9} = \frac{\cancel{(x-3)}(x+2)(x+1)}{(\cancel{x-3})(x+3)} = \frac{20}{6} = \frac{10}{3}$$

hole

$$f(x) = \begin{cases} \frac{x^3 - 7x - 6}{x^2 - 9} \\ \frac{10}{3} \end{cases}$$

all x , $x \neq 3$ $x = 3$ 

① Find the average rate of change of $f(x) = x^3 - x$ over the interval $[1, 3]$

② Find the rate of change at $x=2$

HW

- Finish this algebraically + another way
- Read 2.4 understand it